



## Modelling climate change and malaria transmission

---

**Author(s):** Parham PE, Michael E  
**Book:** Modelling Parasite Transmission and Control  
**Year:** 2010  
**Series:** Advances in Experimental Medicine and Biology, 673  
**Publisher:** Landes Bioscience / Springer Science+Business Media, LLC dual imprint (New York NY)

---

### Abstract:

The impact of climate change on human health has received increasing attention in recent years, with potential impacts due to vector-borne diseases only now beginning to be understood. As the most severe vector-borne disease, with one million deaths globally in 2006, malaria is thought most likely to be affected by changes in climate variables due to the sensitivity of its transmission dynamics to environmental conditions. While considerable research has been carried out using statistical models to better assess the relationship between changes in environmental variables and malaria incidence, less progress has been made on developing process-based climate-driven mathematical models with greater explanatory power. Here, we develop a simple model of malaria transmission linked to climate which permits useful insights into the sensitivity of disease transmission to changes in rainfall and temperature variables. Both the impact of changes in the mean values of these key external variables and importantly temporal variation in these values are explored. We show that the development and analysis of such dynamic climate-driven transmission models will be crucial to understanding the rate at which *P. falciparum* and *P. vivax* may either infect, expand into or go extinct in populations as local environmental conditions change. Malaria becomes endemic in a population when the basic reproduction number  $R_0$  is greater than unity and we identify an optimum climate-driven transmission window for the disease, thus providing a useful indicator for determining how transmission risk may change as climate changes. Overall, our results indicate that considerable work is required to better understand ways in which global malaria incidence and distribution may alter with climate change. In particular, we show that the roles of seasonality, stochasticity and variability in environmental variables, as well as ultimately anthropogenic effects, require further study. The work presented here offers a theoretical framework upon which this future research may be developed.

**Source:** [http://dx.doi.org/10.1007/978-1-4419-6064-1\\_13](http://dx.doi.org/10.1007/978-1-4419-6064-1_13)  
[http://link.springer.com/chapter/10.1007%2F978-1-4419-6064-1\\_13](http://link.springer.com/chapter/10.1007%2F978-1-4419-6064-1_13)

### Resource Description

#### Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content



# Climate Change and Human Health Literature Portal

## **Exposure :**

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Precipitation, Temperature

**Temperature:** Fluctuations

## **Geographic Feature:**

resource focuses on specific type of geography

None or Unspecified

## **Geographic Location:**

resource focuses on specific location

Global or Unspecified

## **Health Impact:**

specification of health effect or disease related to climate change exposure

Infectious Disease

**Infectious Disease:** Vectorborne Disease

**Vectorborne Disease:** Mosquito-borne Disease

**Mosquito-borne Disease:** Malaria

## **Mitigation/Adaptation:**

mitigation or adaptation strategy is a focus of resource

Adaptation

## **Model/Methodology:**

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Methodology

## **Resource Type:**

format or standard characteristic of resource

Research Article, Research Article

## **Timescale:**

time period studied

Short-Term (

## **Vulnerability/Impact Assessment:**

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content